

COMMENTS ON CLAIM SETS

Claim Set (A-1):

(1) Especially, Applicants would like to maintain the range of n as being 1 to 9 while limiting the groups inserted between methylene groups to only -O-.

Concerning the compounds in which n is an integer of 1 to 9, embodiments and a method for preparing them are supported on page 6, lines 7-11, page 14, lines 17-22, and page 22, line 5 to page 23, line 15 of the specification.

(2) In addition, Applicants would like to widen the scope of the substituent Z with respect to the scope proposed by the Examiner. Specifically, groups (Z-4), (Z-5) and (Z-3') are added to the Examiner's proposal.

The groups (Z-4), (Z-5) and (Z-3') are nitrogen-containing aromatic heterocycles and have two bonds bound with Y_1 and Y_2 at meta positions to each other on the ring, similar to the substituents (Z-1) and (Z-3).

Therefore, the groups (Z-4), (Z-5) and (Z-3') may form epoxy compounds having a similar structure to those from the groups (Z-1) and (Z-3). Such epoxy compounds are supported on page 8, lines 1-10, and page 11, line 1 to page 14, line 22. In addition, starting materials for these compounds are disclosed on page 15, line 16 to page 17, line 20. Further, these epoxy compounds may be prepared by using the same method for preparing the epoxy compounds with the groups (Z-1) to (Z-3).

Claim Set (A-2):

The scope of n is maintained and the scope of the substituent Z is limited as in the Examiner's proposal.

Claim Set (B-1):

(1) The range of n is limited to 1 to 4 based on the description "preferably an integer of 1 to 4" on page 4, line 19.

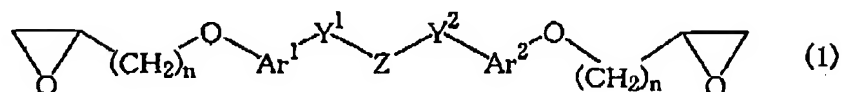
(2) The substituent Z includes the groups (Z-1) to (Z-5) and (Z-3') as in Claim Set (A-1).

Claim Set (B-2):

- (1) The range of n is limited to 1 to 4 based on the description "preferably an integer of 1 to 4" on page 4, line 19.
- (2) The scope of the substituent Z is limited as in the Examiner's proposal.

Proposed Amended Claims (A-1)

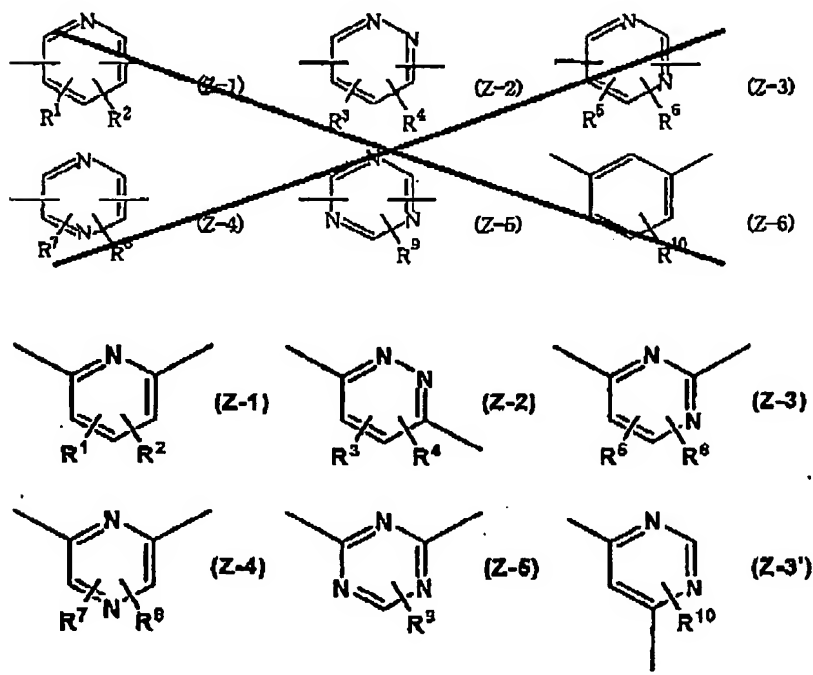
1. An epoxy compound of formula (1):



- 5 wherein n represents an integer of 1 to 9,

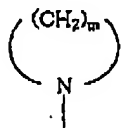
the $-(CH_2)_n-$ group may have inserted $-O-$, ~~or $N(R')$~~ ,
between the methylene groups, ~~wherein R' represents a hydrogen~~
~~atom or a C_{1-10} alkyl group,~~

- 10 Z represents any one of divalent groups of the following
general formulas ~~(Z-1) to (Z-6)~~ (Z-1) to (Z-5) and (Z-3'):



wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} are the same
or different and represent independently a hydrogen atom, a C_{1-18}

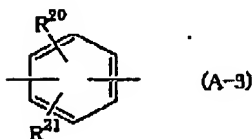
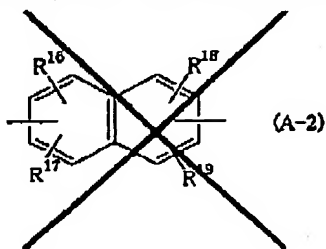
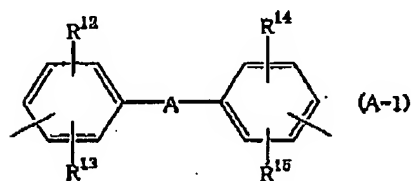
alkyl group, an amino group substituted with one or two C₁₋₁₈ alkyl groups, or a cyclic amino group of the following formula:



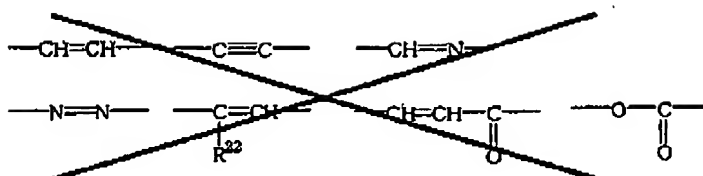
wherein m represents an integer of 4 to 12, and one methylene group or two or more not neighboring methylene groups of the C₁₋₁₈ alkyl group or groups as defined in connection with R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ or R¹⁰, and of the cyclic amino group, may be replaced with -O-, -NH-, -N(R'')- or -S-, wherein R'' represents a C₁₋₁₈ alkyl group,

~~Ar¹ and Ar² are the same or different and represent any one of groups of the following formulas (A-1) to (A-3):~~

Ar¹ is a group of the following formula (A-1), and Ar² is a group of the following formula (A-1) or (A-3):



wherein A represents a single bond and ~~or any one group selected from the group consisting of:~~

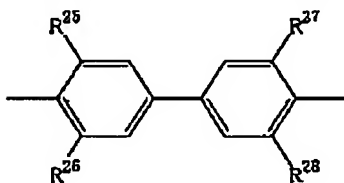


wherein R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , R^{19} , R^{20} , R^{21} and R^{22} , R^{20}
 and R^{21} are the same or different and represent independently
 a hydrogen atom, a halogen atom, ~~a C_{1-10} alkyl group~~ a C_{1-4} alkyl
 group, a C_{1-8} alkoxy group, a cyano group, or a nitro group,

Y^1 and Y^2 ~~are the same or different and represent a single~~
~~bond, O, S, or Si(R^{23})(R^{24}), wherein R^{23} and R^{24} are the~~
~~same or different and represent independently a lower alkyl~~
~~group or a phenyl group.~~ each represent -O-.

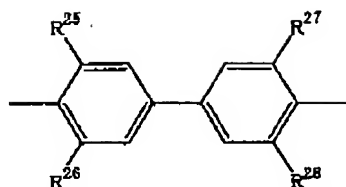
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2. The epoxy compound according to claim 1, wherein Ar^1 and
 Ar^2 in formula (1) are the same or different and represent
 independently a group of the following formula:



15 wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and
 represent independently a hydrogen atom or a methyl group.

3. The epoxy compound according to claim 1, wherein Ar^1 and
 Ar^2 in formula (1) represent the same group of the following
 20 formula:



wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and represent independently a hydrogen atom or a methyl group.

5 4. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 1 and a curing agent.

5. The epoxy composition according to claim 4, wherein the curing agent is an amine-type curing agent or a phenol type
10 curing agent.

6. A cured epoxy resin product obtained by curing the epoxy composition as defined in claim 4.

15 7. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 4 and then semi-curing the epoxy composition.
like.

20 8. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 2 and a curing agent.

9. An epoxy composition, which comprises the epoxy compound

as defined in any one of claim 3 and a curing agent.

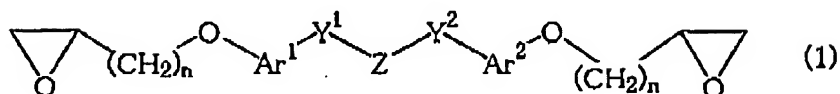
10. A cured epoxy resin product obtained by curing the epoxy composition as defined in claim 5.

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11. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 5 and then semi-curing the epoxy composition.

Proposed Amended Claims (A-2)

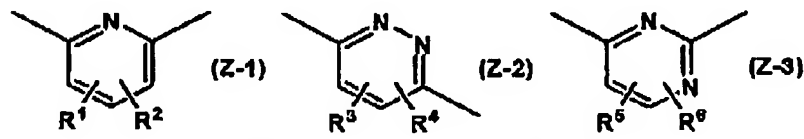
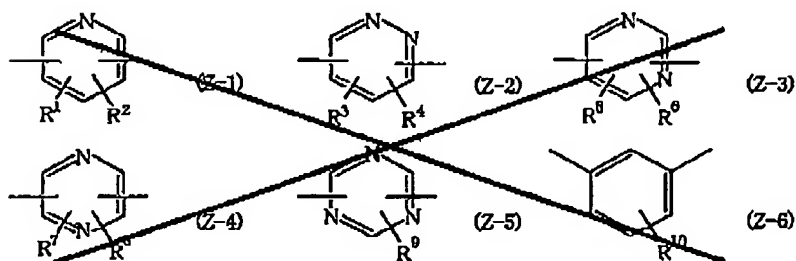
1. An epoxy compound of formula (1):



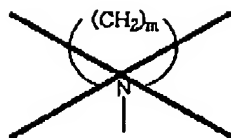
5 wherein n represents an integer of 1 to 9,

the $-(CH_2)_n-$ group may have inserted $-O-$ ~~or $N(R')$~~ between the methylene groups, ~~wherein R' represents a hydrogen atom or a C_{1-10} alkyl group,~~

Z represents any one of divalent groups of the following
10 general formulas ~~(Z-1) to (Z-6)~~ (Z-1) to (Z-5) and (Z-3'):



wherein $R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9$ ~~and R^{10}~~ R^5 and R^6 are
15 the same or different and represent independently a hydrogen
atom, ~~a C_{1-10} alkyl group, an amino group substituted with one
or two C_{1-10} alkyl groups, or a cyclic amino group of the following
formula:~~

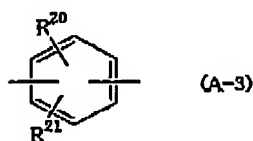
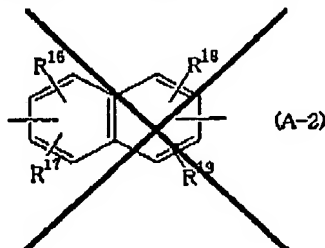
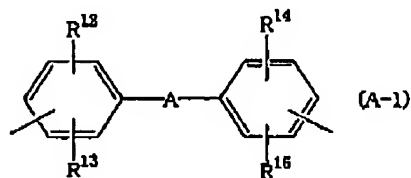


wherein m represents an integer of 4 to 12, and one methylene group or two or more not neighboring methylene groups of the C_{1-10} alkyl group or groups as defined in connection with R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 or R^{10} , and of the cyclic amine group, may be replaced with O, NH, N(R'') or S, wherein R'' represents a C_{1-10} alkyl group, atom or a C_{1-4} alkyl group,

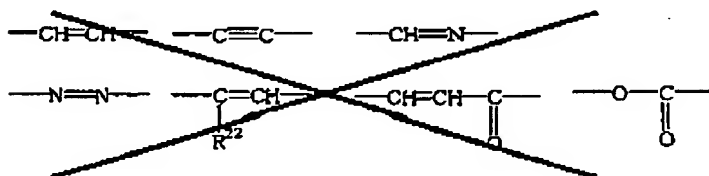
Ar^1 and Ar^2 are the same or different and represent any one of groups of the following formulas (A-1) to (A-3):

Ar^1 is a group of the following formula (A-1), and Ar^2 is

a group of the following formula (A-1) or (A-3):



wherein A represents a single bond and ~~or any one group selected from the group consisting of:~~

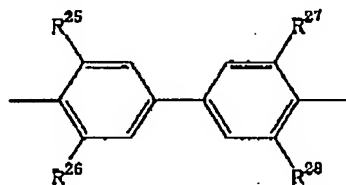


wherein R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , R^{19} , R^{20} , R^{21} and R^{22} , R^{20}

and R^{21} are the same or different and represent independently a hydrogen atom, a halogen atom, ~~a C_{1-10} alkyl group~~ a C_{1-4} alkyl group, a C_{1-8} alkoxy group, a cyano group, or a nitro group,

Y^1 and Y^2 ~~are the same or different and represent a single~~
 5 ~~bond, O, S, or $Si(R^{23})(R^{24})$, wherein R^{23} and R^{24} are the~~
~~same or different and represent independently a lower alkyl~~
~~group or a phenyl group. each represent -O-.~~

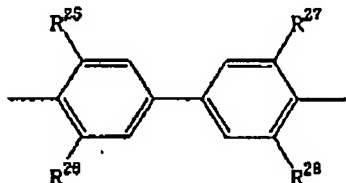
2. The epoxy compound according to claim 1, wherein Ar^1 and
 10 Ar^2 in formula (1) are the same or different and represent
 independently a group of the following formula:



wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and
 represent independently a hydrogen atom or a methyl group.

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3. The epoxy compound according to claim 1, wherein Ar^1 and
 Ar^2 in formula (1) represent the same group of the following
 formula:



20 wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and
 represent independently a hydrogen atom or a methyl group.

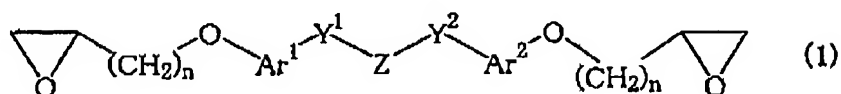
4. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 1 and a curing agent.
- 5 5. The epoxy composition according to claim 4, wherein the curing agent is an amine-type curing agent or a phenol type curing agent.
6. A cured epoxy resin product obtained by curing the epoxy
10 composition as defined in claim 4.
7. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 4 and then semi-curing the epoxy composition.
- 15 like.
8. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 2 and a curing agent.
- 20 9. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 3 and a curing agent.
10. A cured epoxy resin product obtained by curing the epoxy composition as defined in claim 5.

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11. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 5 and then semi-curing the epoxy composition.

Proposed Amended Claims (B-1)

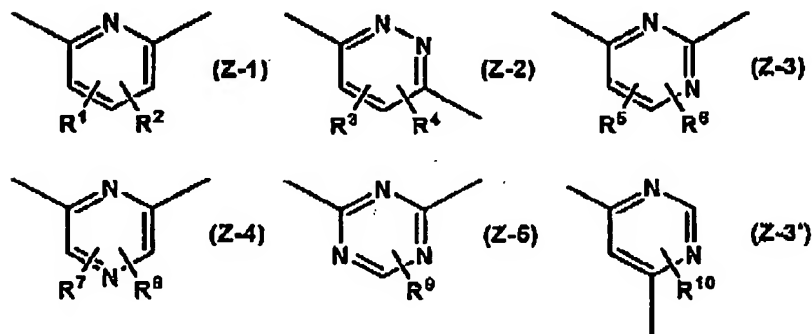
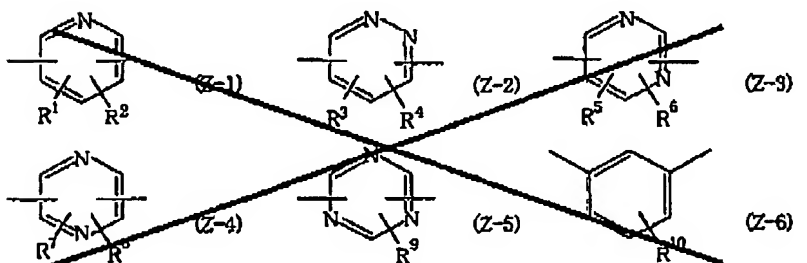
1. An epoxy compound of formula (1):



5 wherein n represents an integer of 1 to 4,

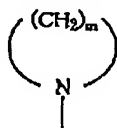
the $-(CH_2)_n-$ group may have inserted ~~$-O-$, or $N(R')$~~
between the methylene groups, ~~wherein R' represents a hydrogen~~
~~atom or a C_{1-18} alkyl group,~~

10 Z represents any one of divalent groups of the following
general formulas ~~(Z-1) to (Z-6)~~ (Z-1) to (Z-5) and (Z-3'):



wherein R^1 , R^2 , R^3 , R^4 , R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} are the same
or different and represent independently a hydrogen atom, a C_{1-18}

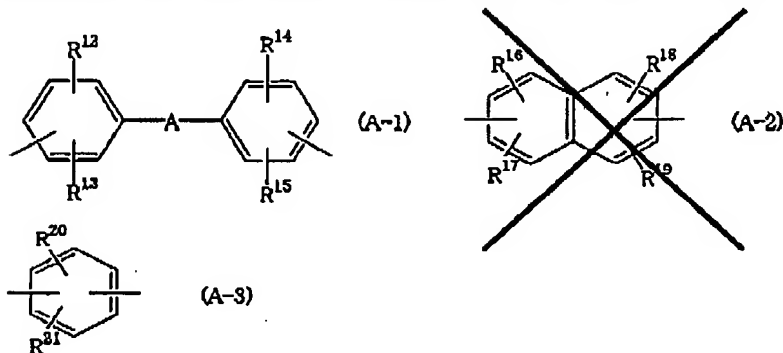
alkyl group, an amino group substituted with one or two C₁₋₁₈ alkyl groups, or a cyclic amino group of the following formula:



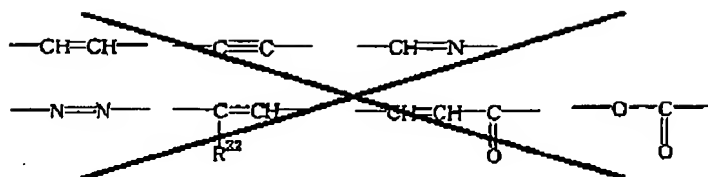
wherein m represents an integer of 4 to 12, and one methylene group or two or more not neighboring methylene groups of the C₁₋₁₈ alkyl group or groups as defined in connection with R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ or R¹⁰, and of the cyclic amino group, may be replaced with -O-, -NH-, -N(R'')- or -S-, wherein R'' represents a C₁₋₁₈ alkyl group,

~~Ar¹ and Ar² are the same or different and represent any one of groups of the following formulas (A-1) to (A-3):~~

Ar¹ is a group of the following formula (A-1), and Ar² is a group of the following formula (A-1) or (A-3):



wherein A represents a single bond ~~and or any one group selected from the group consisting of:~~



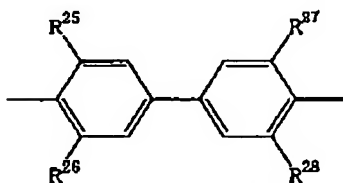
wherein R^{12} , R^{13} , R^{14} , R^{15} , R^{16} , R^{17} , R^{18} , R^{19} , R^{20} , R^{21} and R^{22} are the same or different and represent independently a hydrogen atom, a halogen atom, ~~a C_{1-10} alkyl group~~ a C_{1-4} alkyl

5 group, a C_{1-8} alkoxy group, a cyano group, or a nitro group,

~~Y^1 and Y^2 are the same or different and represent a single bond, O, S, or $Si(R^{23})(R^{24})$, wherein R^{23} and R^{24} are the same or different and represent independently a lower alkyl group or a phenyl group, each represent -O-.~~

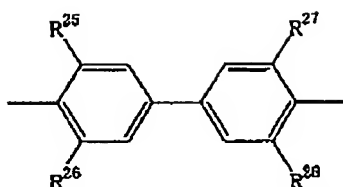
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2. The epoxy compound according to claim 1, wherein Ar^1 and Ar^2 in formula (1) are the same or different and represent independently a group of the following formula:



15 wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and represent independently a hydrogen atom or a methyl group.

3. The epoxy compound according to claim 1, wherein Ar^1 and Ar^2 in formula (1) represent the same group of the following
20 formula:



wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and represent independently a hydrogen atom or a methyl group.

5 4. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 1 and a curing agent.

5. The epoxy composition according to claim 4, wherein the curing agent is an amine-type curing agent or a phenol type
10 curing agent.

6. A cured epoxy resin product obtained by curing the epoxy composition as defined in claim 4.

15 7. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 4 and then semi-curing the epoxy composition.
like.

20 8. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 2 and a curing agent.

9. An epoxy composition, which comprises the epoxy compound

as defined in any one of claim 3 and a curing agent.

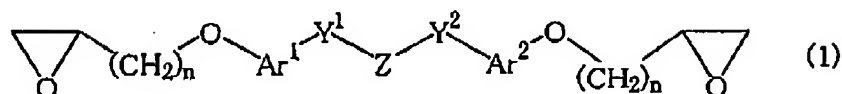
10. A cured epoxy resin product obtained by curing the epoxy composition as defined in claim 5.

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11. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 5 and then semi-curing the epoxy composition.

Proposed Amended Claims (B-2)

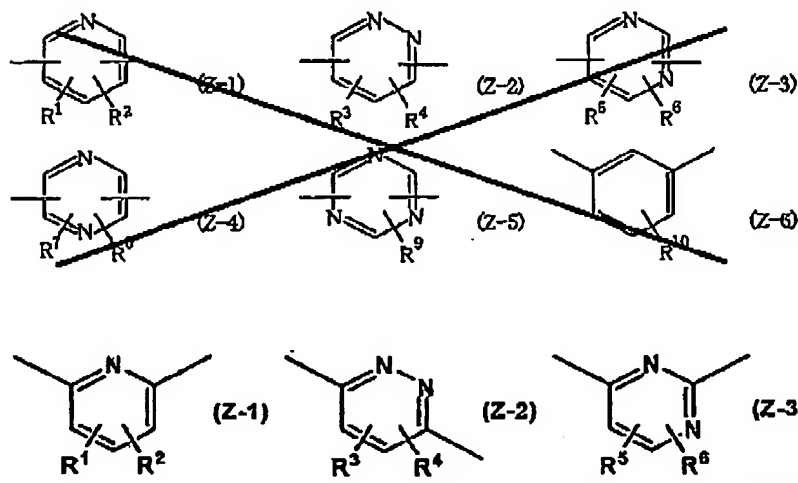
1. An epoxy compound of formula (1):



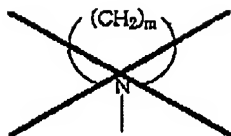
5 wherein n represents an integer of 1 to 4,

the $-(CH_2)_n-$ group may have inserted $-O-$, ~~or $N(R')$~~ ,
between the methylene groups, ~~wherein R' represents a hydrogen
atom or a C_{1-10} alkyl group,~~

Z represents any one of divalent groups of the following
10 general formulas ~~(Z-1) to (Z-6)~~ (Z-1) to (Z-5) and (Z-3'):



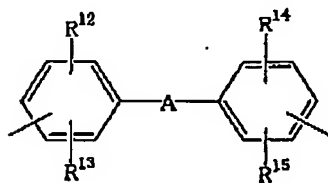
wherein $R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9$ and R^{10} R^5 and R^6 are
the same or different and represent independently a hydrogen
15 ~~atom, a C_{1-10} alkyl group, an amine group substituted with one
or two C_{1-10} alkyl groups, or a cyclic amine group of the following
formula,~~



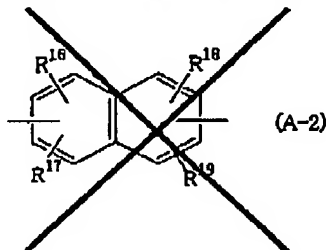
wherein ~~m~~ represents an integer of 1 to 12, and one methylene group or two or more not neighboring methylene groups of the ~~C₁₋₁₀~~ alkyl group or groups as defined in connection with ~~R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ or R¹⁰~~, and of the cyclic amine group, may be replaced with O, NH, N(R¹¹) or S, wherein R¹¹ represents a ~~C₁₋₁₀~~ alkyl group atom or a C₁₋₄ alkyl group,

~~Ar¹ and Ar² are the same or different and represent any one of groups of the following formulas (A-1) to (A-3).~~

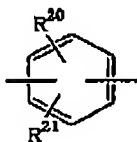
Ar¹ is a group of the following formula (A-1), and Ar² is a group of the following formula (A-1) or (A-3):



(A-1)

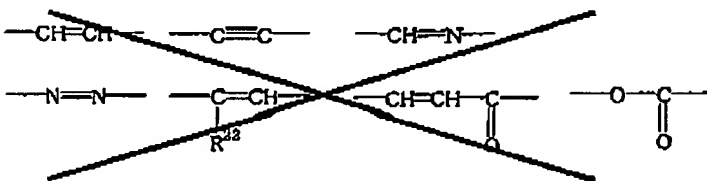


(A-2)



(A-3)

wherein A represents a single bond and ~~or any one group selected from the group consisting of:~~

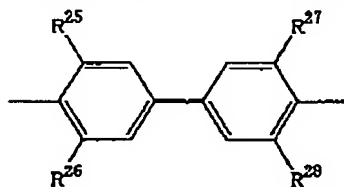


wherein R¹², R¹³, R¹⁴, R¹⁵, ~~R¹⁶, R¹⁷, R¹⁸, R¹⁹, R²⁰, R²¹ and R²²~~, R²⁰

and R^{21} are the same or different and represent independently a hydrogen atom, a halogen atom, ~~a C_{1-10} alkyl group~~ a C_{1-4} alkyl group, a C_{1-8} alkoxy group, a cyano group, or a nitro group,

Y^1 and Y^2 ~~are the same or different and represent a single bond, O, S, or $Si(R^{6a})(R^{6b})$, wherein R^{6a} and R^{6b} are the same or different and represent independently a lower alkyl group or a phenyl group.~~ each represent -O-.

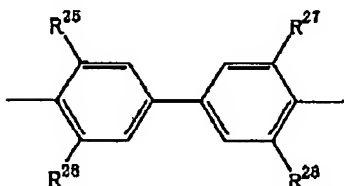
2. The epoxy compound according to claim 1, wherein Ar^1 and Ar^2 in formula (1) are the same or different and represent independently a group of the following formula:



wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and represent independently a hydrogen atom or a methyl group.

15

3. The epoxy compound according to claim 1, wherein Ar^1 and Ar^2 in formula (1) represent the same group of the following formula:



20 wherein R^{25} , R^{26} , R^{27} and R^{28} are the same or different and represent independently a hydrogen atom or a methyl group.

4. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 1 and a curing agent.

5 5. The epoxy composition according to claim 4, wherein the curing agent is an amine-type curing agent or a phenol type curing agent.

6. A cured epoxy resin product obtained by curing the epoxy
10 composition as defined in claim 4.

7. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 4 and then semi-curing the epoxy composition.
15 like.

8. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 2 and a curing agent.

20 9. An epoxy composition, which comprises the epoxy compound as defined in any one of claim 3 and a curing agent.

10. A cured epoxy resin product obtained by curing the epoxy composition as defined in claim 5.

25

11. A prepreg obtained by impregnating or coating a substrate with the epoxy composition of claim 5 and then semi-curing the epoxy composition.